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Callaway Plant

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December 13, 2001

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
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Washington, D.C. 20555-0001

Gentlemen: ULNRC-04582

DOCKET NUMBER 50-483
CALLAWAY PLANT
UNION ELECTRIC COMPANY
CHANGES TO THE NRC APPROVED FIRE PROTECTION PROGRAM

References:
1) NRC Inspection Report 50-483/00-13, dated October 30, 2000
2) ULNRC-4347, dated November 30, 2000
3) NRC letter, dated March 6, 2001
4) ULNRC-04522, dated September 5, 2001

Reference 4 transmitted an application for a license amendment pursuant to 10CFR50.90 to Facility Operating License No. NPF-30 for the Callaway Plant. This proposed license amendment request (LAR) requested approval of the Commission, pursuant to Operating License Condition 2.C(5)(d), to make changes to the approved fire protection program as described in the Final Safety Analysis Report.

Subsequent to this LAR submittal, a telecon was held on November 8, 2001 between AmerenUE and the NRC Staff to discuss the proposed LAR. As a result of this discussion, with the NRC Staff, AmerenUE agreed to provide a revision to Attachment 2 of the submittal transmitted in Reference 4 to address the following issues:

1) More discussion on distances between redundant cables.
2) More discussion on propagation rate of fire in cable trays.
3) Include additional PRA information.
4) More discussion about the combustible material within the switchgear and whether or not the penetrations in the top of the switchgear are sealed.
5) More discussion on the potential for flashover
6) Address issues discussed in NIST Technical Note 1291.

A006

Attachment 2 to this submittal provides a revised description and assessment to replace the Attachment 2 transmitted by Reference 4. This revised Attachment 2 has revision bars indicating the areas of change. Also deleted information is noted by a "strike-thru line" and added information is inserted in **"bold"**. There are no changes to Attachments 3 and 4 provided by Reference 4.

Regulatory Guide 1.189, Fire Protection for Operating Nuclear Power Plants, Section 1.8.4, states that plants licensed after January 1, 1979, that have committed to meet the requirements of Section III.G of Appendix R and are required to do so as a license condition, do not need to request exemptions for alternative configurations. The regulatory guide goes on to state, "However, deviations from the requirements of Section III.G should be identified and justified in the FSAR or FHA and the deviation may require a license amendment to change the license condition. Deviations submitted to the NRC for review and approval should include a technical justification for the proposed alternative approach. The technical justification should address the criteria described in Regulatory Positions 1.8.1, Safety Evaluations, and 1.8.2 for exemptions." This submittal is being made using the guidelines established in Regulatory Guide 1.189.

If you have any questions on this amendment application, please contact Mr. Dave Shafer at (314) 554-3104.

Very truly yours,

John D. Blosser
Manager, Regulatory Affairs

JDB/JMC/

Attachments: 1) Affidavit
2) Description and Assessment

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John D. Blosser, of lawful age, being first duly sworn upon oath says that he is Manager Regulatory Affairs, for Union Electric Company; that he has read the foregoing document and knows the content thereof; that he has executed the same for and on behalf of said company with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By _____
John D. Blosser
Manager Regulatory Affairs

SUBSCRIBED and sworn to before me this 13th day of December, 2001.

_____

GLORIA J. TAYLOR
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STATE OF MISSOURI - CALLAWAY COUNTY
NOTARY SEAL
MY COMMISSION EXPIRES JUNE 21, 2003

ULNRC-04582

ATTACHMENT 2

DESCRIPTION AND ASSESSMENT

DESCRIPTION AND ASSESSMENT

1.0 INTRODUCTION

1.1 This proposed License Amendment Request (LAR) pursuant to 10 CFR 50.90 is seeking approval of the Commission, pursuant to Operating License Condition 2.C(5)(d), to make changes to the approved fire protection program as described in the Final Safety Analysis Report (FSAR) to address the finding the Commission identified in NRC Inspection Report 50-483/00-013 that caused an apparent decrease in the level of fire protection at Callaway Plant. This proposed LAR revises the FSAR to provide clarification of the existing design of the plant. Although the 20-foot separation zones are discussed within the FSAR Fire Hazards Analysis, these discussions are somewhat vague and do not discuss the intervening cable trays and hazards.

1.2 Final Safety Analysis Report (FSAR) Section

The proposed changes to the fire protection program as described in the FSAR that address the Commission's findings are attached. See Attachment 3 for the proposed marked up pages to the FSAR.

2.0 DESCRIPTION

The proposed License Amendment addresses the Non-Cited Violation identified in NRC Inspection Report 50-483/00-013 for redundant trains of safe shutdown equipment in Fire Areas A-1, A-18, and A-27 which do not meet the required separation criteria. This proposed LAR revises the FSAR to provide clarification of the existing design of the plant. Although the 20-foot separation zones are discussed within the FSAR Fire Hazards Analysis, these discussions are somewhat vague and do not discuss the intervening cable trays and hazards. Specifically, the discussions of the 20-foot separation zones are clarified to reflect the cable trays, which traverse through these areas, and the equipment which poses potential hazards within the separation zones. The propagation of fire along the cable trays is not considered credible. This determination is based on the defense in depth of the fire protection features of these areas.

3.0 BACKGROUND

NRC Inspection Report 50-483/00-13 documents an apparent violation regarding the separation of redundant trains of equipment required for safe shutdown. The NRC identified intervening combustibles installed within the 20-foot separation zone between the redundant trains. As discussed in NRC Violation 50-483/0013-01, there are cable trays, a motor control center, an air handling unit, and one of the control rod drive motor generator sets located within the areas marked as the "No Combustible Zone" in Fire Areas A-1, A-18, A-27. The NRC has determined that these components are intervening combustibles and therefore fire hazards.

4.0 TECHNICAL ANALYSIS

NRC Generic Letter 83-33 issued October 19,1983 states, "Numerous comprehensive flammability tests conducted by the Electric Power Research Institute (EPRI NP-1200, EPRI EL-1263), Factory Mutual (Contract RP-1165-1), and Sandia National Laboratories (NUREG/CR-2431, among others) have shown that burning plastic cable insulation represents a significant fire hazard. These tests were conducted on both IEEE-383 qualified and unqualified cable. While the qualified cable exhibited a tendency to ignite and propagate flame less rapidly, combustion of grouped cables continued at significant levels. In particular, grouped vertical cables which are not protected by a fire propagation retardant, such as metal tray covers or fire retardant coatings, can result in rapidly developing fires with high heat release rates."

The cables within the cable trays, which traverse the 20-foot separation zones in Fire Areas A-1, A-18, and A-27 are IEEE-383 rated cables. These cables are considered by the NRC as intervening combustibles because the jacketing on IEEE-383 cables will burn when exposed to an exposure fire as stated above in Generic Letter 83-33. However, IEEE-383-1974, paragraph 2.5.2.1 states, "the cable does not propagate fire even if the outer covering and insulation have been destroyed in the area of flame impingement...". Therefore in the absence of an exposure fire, these cables will not sustain a propagation path from one side of the zone to the other. As stated above, a "No Combustible Zone" has been clearly marked with red lines on the floor, which prevents personnel from placing transient combustibles in the zone. This is enforced by APA-ZZ-00741, Control of Combustible Materials. As evaluated in RFR 6400A, the absence of transient combustibles below the cables eliminates the potential for flame exposure and therefore eliminates the potential for fire propagation.

While Generic Letter 83-33 refers to fire test reports which document that IEEE-383 cable can burn, it should be noted that the fire tests utilized burners under the cable trays stacks to initiate the fire. These burners were located directly beneath the bottom of the horizontal stack of cable trays. In contrast, Room "1403", Fire Area A-27, contains very low quantities of combustible loading other than the insulated IEEE-383 cables in the room. In addition, a 20-foot area between the redundant trains is marked to prevent combustibles from being placed into the area.

Fire Test Report NUREG CR-2431, titled "Burn Mode Analysis of Horizontal Cable Tray Fires" discusses the fire propagation of the trays. Page 9 of this report states in part, "Based on these observations, which show that fires are not propagated from tray to tray due to direct flame exposure, we feel that Regulatory Guide 1.75 separation requirements are adequate to prohibit such propagation. However, physical separation by itself obviously does not necessarily inhibit other mechanisms of fire propagation."

Metal tray covers are installed on cable trays in compliance with Regulatory Guide 1.75. These tray covers are designed to limit the spread of fire from one cable tray to another. Based on these evaluations, a fire propagating across the 20-foot separation zones in the cable trays or other fire hazards in the area is not considered credible. This proposed LAR revises the FSAR but it does not make any actual changes to the plant equipment, rather it provides clarification of the existing design of the plant. Although the 20-foot separation zones are discussed within the FSAR Fire Hazards Analysis, these discussions are somewhat vague and do not discuss the intervening cable trays

and hazards. This change to the FSAR clarifies the existing design configuration of Fire Areas A-1, A-18, and A-27. Specifically, the discussions of the 20-foot separation zones are clarified to reflect the cable trays, which traverse through these areas, and the equipment which poses potential hazards within the separation zones. The propagation of fire along the cable trays is not considered credible. This determination is based on the defense in depth of the fire protection features for these areas. These fire protection features are listed in the following summary:

- Administrative controls that limit transient combustibles in the room,
- Administrative controls that prevent the placement of transient combustibles within the 20 foot separation "No Combustible Zone",
- Administrative controls that address potential ignition sources in the room,
- Low quantity of fixed combustible loading,
- Installation of IEEE-383 qualified cables,
- Area wide early warning fire detection,
- Total flooding halon system with a 100% reserve bank for fire areas A-27 & A-18; a preaction sprinkler system in fire area A-1.
- Manual fire suppression capability including hose stations, standpipes, and portable fire extinguishers,
- Well trained and well equipped fire brigade,
- When required by Regulatory Guide 1.75 Electrical raceways are enclosed with sheet-metal covers that limit the propagation of fire from one tray to another.
- Areas are enclosed with a 3-hour rated barrier, 3-hour rated fire doors, penetration seals, and fire dampers to prevent propagation from another fire area.
- Administrative controls for addressing operability of the fire protection features.

This evaluation is consistent with guidance provided in NRC Generic Letter 86-10, Enclosure 2, Section 3.6.1. This section of the Generic Letter states exemptions have been granted by the NRC for more than negligible quantities of combustible material existing between redundant shutdown divisions based on the following factors:

1. A relatively large horizontal spatial separation between redundant divisions; all cables qualified to IEEE-383.

2. The presence of an automatic fire suppression system over the intervening combustible (such as a cable tray fire suppression system);

3. The presence of fire stops to inhibit fire propagation in intervening cable trays;

4. The likely fire propagation direction of burning intervening combustibles in relation to the location of the vulnerable shutdown division;

5. The availability of compensating active and passive fire protection.
Also, GL 86-10, Section 3.6.2 states in part, "cables in cable trays having sheet metal bottom, sides and top, if protected by automatic fire detection and suppression systems and if the design is supported by a fire hazards analysis, have been found acceptable under the exemption process."

The conclusions provided in the Fire Hazards Analysis for these fire areas remains valid. They state that a fire in these areas will not prevent safe shutdown of the plant.

Listed below is a more detailed analysis of each of the affected fire area:

Fire Area A-1
Analysis

Fire Area A-1 Description:
Fire Area A-1 contains a large section of the Auxiliary Building. Specifically, this area contains the corridors and general areas, 1974' elevation, entire 1988' elevation and the vestibule corridor to the auxiliary feedwater Pump Rooms on 2000' elevation. This area contains the letdown heat exchanger and associated piping and valves and instrumentation; reactor makeup water pumps; normal charging pump; CVCS chiller pumps; moderating heat exchanger; letdown reheat heat exchanger; letdown chiller heater exchanger; chiller surge tank; auxiliary building dry waste compactor; CVCS chiller unit; auxiliary steam deaerator feed pumps; auxiliary steam condensate recovery and storage tank; auxiliary building sump pumps; auxiliary feedwater pump room sump and sump pumps. Room 1101 of Fire Area A-1 is the west corridor of the 1974' elevation of the Auxiliary Building. The affected portion of this corridor is shown in Figure 1.

Fire Protection Features:
Fire Area A-1 is separated from other fire areas by a 3-hour rated fire barrier. The entrances into the area are sealed with 3-hour rated fire doors, penetrations are sealed with 3-hour rated penetration seals, and the ventilation ducts have 3-hour rated dampers. Equipment hatches between floors are not rated but are enclosed with metal doors and are protected with water curtains. The fire protection features provided by the equipment hatches and water curtains were found to be acceptable by the NRC staff as documented in Section 9.5.1.4 of NUREG-0830, Supplement No.3, dated May 1984.

Electrical cable installed in the room satisfies the design requirements of IEEE-383.

Fire Area A-1 has an automatic early warning fire detection system. There are more than 10 ionization detectors in Corridor 1101. Specifically, there are two ionization detectors directly in the separation area. In addition much of this area is protected with an automatic preaction sprinkler system. Upon activation of the detection system, the ventilation system will be isolated. If communication is lost between the detector circuits and the control room fire alarm panel, a trouble alarm will be annunciated on the control room panel. Administrative procedures require a continuous fire watch to be posted in this area when the detection or suppression system is inoperable. Fire protection system and components impairments are tracked on the Fire Protection Impairment Program (FPIP) System. The Control Room monitors and statuses the FPIP System.

Fire dampers within the ventilation ducts will close when heat melts the thermal links. Manual fire suppression capability includes a hose station with 75 feet of 1-1/2" hose and standpipes. Portable ABC dry chemical fire extinguishers are also located in the corridor.

Redundant Safe Shutdown Equipment:
Room 1101 contains cables associated with both trains of centrifugal charging. Cables associated with Train "B" centrifugal charging are contained in a conduit that is located a horizontal distance of 35 feet from a junction box and conduit that contains cables associated with Train "A" centrifugal charging. A 20 foot wide "No Combustible Zone" has been marked on the floor within the 35 feet of separation.

Combustible Loading of Entire Fire Area:
The total quantity of combustible loading in room 1101 is less than 50,000 Btu/sq. ft. This quantity includes potential transient combustibles brought into the room. This is considered a very low quantity of combustible loading (quantities less than 100,000 Btu/sq. ft. are considered a low quantity of combustible loading per NFPA Fire Protection Handbook, 18th Ed., Page 7-80). Other than the IEEE-383 cables, the fixed combustible loading in the area between redundant trains is negligible.

Intervening Combustibles Within Separation Zone:
As discussed in NRC Violation 50-483/0013-01, there are cable trays located within the area marked as the "No Combustible Zone", and the NRC has determined that these components are intervening combustibles.

The cable trays located in the "No Combustible Zone" are non-safety related cables. There are two sets of horizontal cable trays in the area, see Figure 1. These two sets of cable tray are separated by approximately 3 feet. The set to the west side of the room is located four feet from the west wall and consists of 3 horizontally stacked trays. The bottom two trays coming from the north are enclosed with metal tray covers for more than 50 feet leading up to the separation zone. The top tray in this set has a metal tray cover within a portion of the 20-foot separation zone. The other cable tray set contains three horizontally stacked trays, which are located approximately three feet from the east wall. A 12-foot section of these trays is covered in the immediate vicinity of the "A" train raceway. These cable trays are also covered at the south end of the 20-foot separation zone for 40 feet in the south direction. The cable in both set of cable trays is IEEE-383 rated cable. The west cable trays pass approximately 1 foot from the conduit that contains cables associated with "B" Train component cooling water.

As stated above, a "No Combustible Zone" has been clearly marked with red lines on the floor that would prevent personnel from placing transient combustibles in the zone. This is enforced by APA-ZZ-00741, Control of Combustible Materials.

Potential for Fire Propagation:
For a fire in Fire Area A-1 to propagate in a manner that damages both redundant components, the fire would have to sustain itself through the intervening combustibles in the area which separates the redundant components. Other than the cable trays, the fixed combustible loading in the area is negligible. The intervening cables are IEEE-383 rated cables. The fire would have to propagate along the IEEE-383 cables because no transient combustibles are located under the cable trays for the 20 foot wide "No Combustible Zone. This propagation is not considered credible because the area is protected with an automatic preaction sprinkler system. Although cable trays do traverse the 20 foot wide marked "No Combustible Zone", metal tray covers are installed on the trays in compliance with Regulatory Guide 1.75. The tray covers are designed to prevent ignition from exposure fires. **The intervening trays are covered in the area of both redundant components.**

In addition, the redundant cables are enclosed in conduit. Therefore, direct impingement from the intervening cables to the redundant components is not considered credible because the fire would have to pass through metal tray covers, a horizontal air space of one foot, and through the walls of the conduit. The ventilation system is isolated upon activation of the detection system. Therefore, additional oxygen and air movement will not be supplied to the corridor. The propagation rate of fire in IEEE-383 cables with no additional fuel source is assumed to be very low. This conclusion is supported by industry fire events that occurred at Waterford 3 in 1995 and San Onofre in early 2001. In both of these events, the fire originated in switchgear and caused damage to cable trays located directly above the electrical cabinet. The rooms did not contain an automatic suppression system. In both of these events, the fire brigades were hesitant to apply water on the electrical equipment and the fires lasted greater than one hour. Based on the best available information of both events, minimal propagation occurred along the horizontal cable trays that contained IEEE 383 cable during the fires. In Fire Area A-1, since the components are separated by 35 feet, the Fire Brigade is expected to respond before complete propagation along the cable trays. Fire Brigade drills within the Auxiliary Building have consistently demonstrated response times of less than a half hour. Since the receipt of the Operating License, the Fire Brigade has been trained to use water on electrical cable fires. This training has been reinforced in recent years based on industry operating experience (NRC Information Notice 95-33 and INPO SEN 126).

Fire ignition in the redundant component due to flashover is not considered credible. The "B" Train conduit containing the redundant circuits is located greater than three feet from the ceiling. The corridor is greater than 2700 square feet. This area is open to the entire corridor of the 1974' elevation which is greater than 10,000 square feet floor area. With this volume of open floor area and the slow burning rate of the IEEE-383 cables, it is assumed that a hot gas layer will be slow to develop. Tests have demonstrated that IEEE-383 cables exhibit near zero total heat release rates during the first five minutes of the test (Reference 4). It is not considered credible for the redundant cables within the conduit to be damaged by the fire. ~~The only credible fire in this area is from transient combustibles and the fire would have to propagate along the cable trays that contain IEEE-383 cables. It is not credible for a fire to propagate along the cable trays without additional combustible loading below the trays to sustain the fire in the trays. It should be noted lab tests that have determined that IEEE-383 cables will burn, contained a fuel source other than the cables. This fire would have to travel for 35 feet and then jump from cable trays that are covered with metal tray covers over into a conduit that is a horizontal distance of 1 foot away. Other than the cable trays, the fixed combustible loading in the area is negligible. A fire of this type is not considered credible.~~

The Control Room uses Fire Preplans and they have a section that discusses safe shutdown. The Fire Preplan for this fire area addresses separation of the centrifugal charging trains. The Control Room's use of the Fire Preplan during an actual event would therefore make them aware of the potential consequences of a fire in this area. The Preplan also states, "The brigade should maintain integrity of the 20' separation zone for safe shutdown capabilities."

The IPEEE Fire Evaluation subdivided fire area A-1 such that Room 1101 was in Fire Area A-1A. The IPEEE completed in 1996 determined the Core Damage Frequency for

area A-1A to be 8.61 E-8. No substantial changes have been made to this fire area since that time. **The IPEEE was conducted using the EPRI Fire-Induced Vulnerability Evaluation (FIVE) methodology, an NRC approved quantitative screening technique. This fire area did not screen out (< 1 E-6) in the original screening process, and therefore fire modeling was conducted using the FIVE software code. The fire modeling considered the fixed ignition sources in the room. No changes were determined to be necessary for this fire area based on the conclusion of the IPEEE. The Callaway IPEEE Submittal was accepted as complete by the NRC as documented in the NRC letter dated 9/14/99.**

Conclusion:
Even though cable trays do traverse the 20' separation zone, the above evaluation has determined it is not credible for a fire to propagate to both of the redundant components in Fire Area A-1.

Fire Area A-18
Analysis

Fire Area A-18 Description:
Fire Area A-18 is located on the 2026' elevation of the Auxiliary Building in Room 1410. This room is the north electrical penetration room. See Figure 2 for a diagram of the room.

Fire Protection Features:
This room is enclosed in a 3-hour rated fire barrier. The entrances into the room are sealed with 3-hour rated fire doors, penetrations are sealed with 3-hour rated penetration seals, and the ventilation ducts have 3-hour rated fire dampers.

Electrical cable installed in the room satisfies the design requirements of IEEE-383.

Fire Area A-18 has an automatic early warning fire detection system. In addition this room is protected with an automatic halon fire suppression system. This halon 1301 system is designed to be activated by the cross-zoned detection system and will provide a minimum five percent concentration at the height of the highest combustible in the room for 10 minutes. The halon storage cylinders, which include a 100 percent reserve bank, are located outside of the room. Upon activation of the detection system, the ventilation system will be isolated and the fire dampers within the ventilation ducts will close when the electro-thermal links receive an electrical signal from the alarm panel. The detection system in the room contains two different zones. Even if one zone were to fail, the other zone would be operational. Specifically, there are six detectors between the redundant trains of equipment. If communication is lost between detector circuits and the control room fire alarm panel, a trouble alarm will be annunciated on the control room panel. Administrative procedures require a continuous fire watch to be posted in this area when the detection or suppression system is inoperable. Fire protection system and components impairments are tracked on the FPIP System. The Control Room monitors and statuses the FPIP System.
Manual fire suppression capability includes a hose station with 75 feet of 1-1/2" hose and a standpipe outside of both entrance doors. Portable ABC dry chemical fire extinguishers are also located outside both entrance doors to the room.

Redundant Safe Shutdown Equipment:
Room 1410 contains redundant safe shutdown equipment. A motor control center is located in the northwest corner of the room and contains fuses in the circuits for the control valves for motor driven auxiliary feedpump supply to the "B" and "C" steam generators. At the east end of the room, at a distance greater than 30 feet away are two conduits containing cables of redundant train equipment. One conduit contains cables that are associated with operating the "B" train Auxiliary Feedwater Pump discharge isolation valves. The other conduit contains a cable associated with the valve position control signal to the positioner on the "A" steam generator atmospheric PORV.

Combustible Loading of Entire Fire Area:
The total quantity of combustible loading in the room is less than 50,000 Btu/sq.ft. This quantity includes potential transient combustibles brought into the room. This is considered a very low quantity of combustible loading (quantities less than 100,000 Btu/sq.ft. are considered a low quantity of combustible loading per NFPA Fire Protection Handbook, 18th Ed., Page 7-80).

Intervening Combustibles Within Separation Zone:
There are cable trays located within the area marked as the "No Combustible Zone". These cable trays contain non-safety related IEEE-383 cables. There are 3 sets of horizontally stacked trays. The trays closest to the "B" Train cables are more than 10 feet from the cables. Motor Control Center (MCC) NG01T and NG03T are also located within the separation zone. **These motor control centers are 480 volts. As stated in Regulatory Guide 1.189, Section 4.1.3.6, "Electrical cabinets present an ignition source for fires and a potential for explosive electrical faults that can result in damage not only to the cabinet of origin, but also to equipment, cables, and other electrical cabinets in the vicinity of the cabinet of origin."** The MCCs are enclosed in metal cabinets and are located approximately 12 feet from conduit 4J3C1C. **The combustible material in the cabinets is primarily cable insulation. The penetrations in the top of the cabinet are sealed with vapor and dust seals. These seals are constructed of silicone foam material, which is the same material used in fire barrier penetration seals.** The room cooler is located approximately 4 feet from conduits 4J3C1C and 1J1097. The room cooler contains minimal combustible material **and is not considered a credible fire hazard**.

Potential for Fire Propagation:
Although cable trays do traverse the 20 foot wide marked "No Combustible Zone", there are no continuous runs of cable trays **between** ~~from~~ the separated components ~~that are greater than 20 feet apart. It is not credible for a fire to propagate from one side of the separation area to the other side based on the total quantity of combustibles located in the room.~~ **In the event the automatic suppression system in this room failed and the fire propagated along the intervening cable trays, the fire would not directly impinge the redundant cables on the plant east side of the room. These cables are enclosed in conduit and are located greater than 10 feet from the intervening cable trays.** ~~Fire would have to traverse from one cable tray and ignite cable within a conduit at a distance greater than 10 feet away.~~ **Fire ignition in the redundant component due to flashover is not considered credible. The ventilation system is isolated upon activation of the detection system. Therefore, additional oxygen and air movement will not be supplied to the room. The propagation rate of fire in IEEE-383 cables with no additional fuel source is assumed to be very low. This conclusion is supported by industry fire events that occurred at Waterford 3 in**

1995 and San Onofre in early 2001. In both of these events, the fire originated in switchgear and caused damage to cable trays located directly above the electrical cabinet. The rooms did not contain an automatic suppression system. In both of these events, the fire brigades were hesitant to apply water on the electrical equipment and the fires lasted greater than one hour. Based on the best available information of these events, minimal propagation occurred along the horizontal cable trays that contained IEEE 383 cable during the fires. In Fire Area A-18, since the components are separated by greater than 20 feet, the Fire Brigade is expected to respond before complete propagation along the cable trays. Fire Brigade drills within the Auxiliary Building have consistently demonstrated response times of less than a half hour. Since the receipt of the Operating License, the Fire Brigade has been trained to use water on electrical cable fires. This training has been reinforced in recent years based on industry operating experience (NRC Information Notice 95-33 and INPO SEN 126).

Fire ignition in the redundant component due to flashover is not considered credible. Conduit 4J3C1C is located greater than three feet below the ceiling. The room is greater than 1600 square feet in floor area. Considering the volume of the room and the slow burning rate of the IEEE-383 cables, a hot gas layer will be slow to develop. Tests have demonstrated that IEEE-383 cables exhibit near zero total heat release rates during the first five minutes of the test (Reference 4). It is not considered credible for the redundant cables within the conduit to be damaged by the fire.

The "B" train auxiliary feedwater discharge isolation valves and steam generator PORV (ABPV0001) control cables are enclosed in conduit located at the east end of the room. The raceways associated with these cables are located at a distance greater than 20 feet away from any opposite train auxiliary feedwater components or cables. If the raceways associated with the "B" train motor-driven auxiliary feedwater system are lost, the "A" train motor driven auxiliary feedwater system components would still be available. However, manual operator action would be required to manipulate the "B" steam generator atmospheric PORV (ABPV0002) since its control cable could also be lost in the fire. Three narrow range level transmitters are available to monitor steam generator "A" level; therefore wide range level transmitter LT-501 is allowed to fail.

The Control Room uses Fire Preplans and they have a section that discusses safe shutdown. The Fire Preplan for this fire area addresses the separation of the auxiliary feedwater pump circuits and the separation of the steam generator atmospheric PORVs. The Control Room's use of the Fire Preplan during an actual event would therefore make them aware of the potential consequences of a fire in this area. The Preplan also states, "The brigade should maintain integrity of the 20' separation zone for safe shutdown capabilities."

The IPEEE Analysis for this Room completed in 1996 determined the Core Damage Frequency for the Room to be 1.70 E-7. No substantial changes have been made to this fire area since that time. **The IPEEE was conducted using the EPRI Fire-induced Vulnerability Evaluation (FIVE) methodology, an NRC approved quantitative screening technique. This room screened out (CDF < E-6) during the initial conservative screening stages which assumed a complete loss of equipment in the room. No changes were determined to be necessary for this fire area based**

on the conclusion of the IPEEE. The Callaway IPEEE Submittal was accepted as complete by the NRC as documented in the NRC letter dated 9/14/99.

Conclusion:
Even though cable trays do traverse the 20' separation zone, the above evaluation has determined it is not credible for a fire to propagate to both of the redundant components in Fire Area A-18.

Fire Area A-27
Analysis

Fire Area A-27 Description:

Fire Area A-27 is located on the 2026' elevation of the Auxiliary Building in Room 1403. This room contains the Control Rod Drive MG Sets and the reactor trip switchgear. See Figure 3 for a diagram of the room.

Fire Protection Features:
This room is enclosed in a 3-hour rated fire barrier. The entrances into the room are sealed with 3-hour rated fire doors, penetrations are sealed with 3-hour rated penetration seals, and the ventilation ducts have 3-hour rated dampers.

Electrical cable installed in the room satisfies the design requirements of IEEE-383.

Fire Area A-27 has an automatic early warning fire detection system. In addition this room is protected by an automatic halon fire suppression system. This halon 1301 system is designed to be activated by the cross-zoned detection system and will provide a minimum five percent concentration at the height of the highest combustible in the room for 10 minutes. The halon storage cylinders include a 100 percent reserve bank and are located outside of the room. Upon activation of the detection system, the ventilation system will be isolated and the fire dampers within the ventilation ducts will close when the electro-thermal links receive an electrical signal from the alarm panel. There are two fire detection zones in the room. There are six ionization smoke detectors mounted on the ceiling directly in the area between the redundant circuits. If communication is lost between the detector circuits and the control room fire alarm panel, a trouble alarm will be annunciated on the control room panel. Administrative procedures require a continuous fire watch to be posted in this area when the detection/suppression system is inoperable. Fire Protection system and component impairments are tracked on the FPIP System, and the Control Room monitors and statuses the FPIP System.

Manual fire suppression capability includes a hose station with 75 feet of 1-1/2" hose and a standpipe located at the north end of the room near the entrance door. Portable ABC dry chemical fire extinguishers are located at both the north end and south end of the room. In addition, another ABC extinguisher is located just outside the entrance to the room.

Redundant Safe Shutdown Equipment:
Room 1403 contains redundant safe shutdown equipment that is separated by a distance greater than 20 feet. Direct current contactor BB07 contains circuits for Train "A" RCS Pressurizer Power Operated Relief Valve, BBPCV0455A, and is it located at

the north end of the room. Circuits for BBPCV0456A, Train "B" RCS Pressurizer Power Operated Relief Valve, and BBHV8000B, Train "B" RCS Pressurizer Outlet Power Operated Relief Block Valve are located on the south end of the room. These redundant train components are separated by more than 89 feet. A 20 foot wide "No Combustible Zone" has been marked on the floor at the southern end of the 89 foot wide separation. Also, a raceway that contains cables for the Train "A" component cooling water pumps is located near the center of the room. The cables for the Train "B" component cooling water pumps are located at the south end of the room. These redundant systems are separated by a distance of greater than 52 feet. The 20 foot wide "No Combustible Zone" mentioned above also separates these circuits.

Combustible Loading of Entire Fire Area:
The total quantity of combustible loading in the room is less than 50,000 Btu/sq. ft. This quantity includes potential transient combustibles brought into the room. This is considered a very low quantity of combustible loading (quantities less than 100,000 Btu/sq.ft. are considered a low quantity of combustible loading per NFPA Fire Protection Handbook, 18th Ed., Page 7-80).

Intervening Combustibles Within Separation Zone:
As discussed in the NRC Violation 50-483/0013-01, there are cable trays, a motor control center, an air handling unit, and one of the control rod drive motor generator sets located within the area marked as the "No Combustible Zone", and the NRC has determined that these components are intervening combustibles and therefore fire hazards.

The cable trays located in the "No Combustible Zone" are non-safety related cables. There are two sets of cable trays in the area. The non-safety related cables are separated from the safety related cables in the room in accordance with Regulatory Guide 1.75. The set of cable trays in the west side of the area is located approximately 2'-6" from the west wall and contains three horizontally stacked cable trays. Each of these cable trays has a metal cover for over 50 feet of the tray length that provides some level of separation from the other cable trays. The set of three cable trays in the east side of the room within the zone are open trays which are also horizontally stacked. Motor control center PG20G is located in the separation zone and it is a 480 volt non-safety related load center. **As stated in Regulatory Guide 1.189, Section 4.1.3.6, "Electrical cabinets present an ignition source for fires and a potential for explosive electrical faults that can result in damage not only to the cabinet of origin, but to equipment, cables, and other electrical cabinets in the vicinity of the cabinet of origin."** This MCC is located in a cabinet enclosed in sheet metal. The combustible ~~components~~ **material within the cabinets is primarily cable insulation.** ~~are located inside of the enclosed cabinet~~. The cables exiting the cabinet lead into the cable trays discussed above. **The cable penetrations in the top of the cabinet are sealed with dust and vapor seals. The seals are constructed of silicone foam material, which is the same material used in fire barrier penetration seals.** This cabinet is located a horizontal distance of greater than 8 feet from the edge of the cable trays containing the cables associated with the "B" Train Pressurizer PORV valve and the "B" Train component cooling water circuits.

Air handling unit SGL20 is located within the separation zone and it is the air handling unit for the room itself. The air handling unit is located at a distance of greater than 9 feet from the "B" train cable. Based on the distance from the cables and the insignificant

combustible loading of the unit, the air handling unit is not considered a fire hazard that can pose a threat to these cables.

Control rod drive motor generator set SF01 is also located within the separation zone. The motor generator set is located at a distance of greater than 17 feet from the 'B' train cables mentioned above. This motor generator set contains minimal combustible material. **The cable penetration in the top of the electrical control box are sealed with dust and vapor seals. The seals are constructed of silicone foam material, which is the same material used for fire barrier penetration seals. This motor generator set** ~~and~~ is therefore not considered a hazard that poses a threat to the 'B' train cables.

Potential for Fire Propagation:
Although cable trays do traverse the 20 foot wide marked "No Combustible Zone", there are no continuous runs of cable trays from the separated components. The pressurizer PORV **redundant** circuits are located a distance of greater than 89 feet apart and the component cooling water **redundant** circuits are located a distance of greater than 52 feet apart. ~~It is not credible for a fire to propagate from one end of the room to the other with the total quantity of combustible material located in the room.~~ **The motor control center within the 20' foot separation zone is considered a potential ignition source of the cables. However, as stated above, the cable penetrations in the top of this MCC are sealed. The intervening cable trays overhead are covered. Also, the motor generator set within the 20 foot separation zone is sealed at the top of the electrical control box. In addition, this motor generator set is more than 10 feet in horizontal distance from the intervening cable trays that are routed nearest to the redundant cables. In the event the automatic suppression system in this room failed and the fire propagated along the intervening cable trays, the fire would not directly impinge the redundant cables on the plant north end of the room. These cables are enclosed in conduit and an enclosed junction box. The intervening cable trays in the area of this conduit are covered with sheet metal tray covers. The ventilation system is isolated upon activation of the detection system. Therefore, additional oxygen and air movement will not be supplied to the room. Therefore, fire ignition in the redundant cable due to flashover is not considered credible. The propagation rate of fire in IEEE-383 cables with no additional fuel source is assumed to be very low. This conclusion is supported by industry fire events that occurred at Waterford 3 in 1995 and San Onofre in early 2001. In both of these events, the fire originated in switchgear and caused damage to cable trays located directly above the electrical cabinet. The rooms did not contain an automatic suppression system. In both of these events, the fire brigades were hesitant to apply water on the electrical equipment. In both of these events, the fires lasted greater than one hour. Based on the best available information of these fire events, minimal propagation occurred along the horizontal cable trays that contained IEEE 383 cable during the fires. In Fire Area A-27, since the components are separated by greater than 50 feet, the Fire Brigade is expected to respond before complete propagation along the cable trays. Fire Brigade drills within the Auxiliary Building have consistently demonstrated response times of less than a half hour. Since the receipt of the Operating License, the Fire Brigade has been trained to use water on electrical cable fires. This training has been reinforced in recent years based on industry operating experience (NRC Information Notice 95-33 and INPO SEN 126).**

Fire ignition in the redundant component due to flashover is not considered credible. The redundant cables are located greater than three feet below the ceiling. The room is greater than 2200 square feet in floor area. Considering the volume of the room and the low burning rate of the IEEE-383 cables, a hot gas layer will be slow to develop. Tests have demonstrated that IEEE-383 cables exhibit near zero total heat release rates during the first five minutes of the test (Reference 4). It is not considered credible for the redundant cables within the conduit to be damaged by the fire.

Cables for PORV BBPCV0456A traverse the area from the south wall about 8 feet from where the trays turn west to exit through a fire rated penetration seal into the control building. The trays are approximately 16 feet and 18 feet from the floor. The trays are covered on top for a distance of about 3 feet from the west wall. The trays directly beneath them are covered on the top and bottom for about 7 feet.
If a fire damages a cable that would prevent the operation of BBPCV0456A, then BBPCV0455A can be operated to relieve RCS pressure if needed. The horizontal separation of greater than 89 feet will prevent a fire from damaging both valves. As shown on Figure 3, there is no continuous propagation path from the BBPCV0456A cables to the BBPCV0455A circuits. The fire would have to propagate along 75 feet of cable trays and ~~jump over~~ **ignite** the next set of trays. The majority of tray segments are completely covered with sheet-metal covers. **As stated above, the fire brigade is expected to respond before propagation could occur the length of the trays.**

The Control Room uses Fire Preplans and they have a section that discusses safe shutdown. The Fire Preplan for this fire area addresses the separation of the pressurizer PORVs. The Control Room's use of the Fire Preplan during an actual event would therefore make them aware of the potential consequences of a fire in this area. The Preplan also states, "The brigade should maintain integrity of the 20' separation zone for safe shutdown capabilities."

The IPEEE Analysis for this Room completed in 1996 determined the Core Damage Frequency for the Room to be 2.27 E-7. There have been no substantial changes to this fire area since that time. **The IPEEE was conducted using the EPRI Fire-induced Vulnerability Evaluation (FIVE) methodology, an NRC approved quantitative screening technique. The evaluation conservatively assumed a conditional probability of core damage (P2) value of 1.0 for this area. As a result, this fire area did not screen out (< 1 E-6) in the original screening process, and therefore fire modeling was conducted using the FIVE software code. The fire modeling considered the fixed ignition sources in the room. Electrical cabinet PG20G located within the "No Combustible Zone" did not screen during the review and was considered as an ignition source. The heat release rate (HRR) for this electrical cabinet used in the fire modeling was a value that was referenced by EPRI Report Project 3385-01, Fire Risk Analysis Implementation Guide, Appendix I and was substantiated by Sandia test in NUREG/CR-4527 for vertical cabinet fires. The fire modeling assumed the cabling above the electrical cabinet would ignite. Based on these sources, the Core Damage Frequency was determined to be 2.27 E-7. No changes were determined to be necessary for this fire area based on the conclusion of the IPEEE. The Callaway IPEEE Submittal was accepted as complete by the NRC as documented in the NRC letter to Union Electric dated 9/14/99.**

Conclusion:
Even though cable trays do traverse the 20' separation zone, the above evaluation has determined it is not credible for a fire to propagate to both of the redundant components in Fire Area A-27.

Proposed Changes to the FSAR:
The following FSAR sections are revised to clarify the plant design configuration for intervening combustibles in the affected 20-foot separation zones:

For Fire Area A-1, FSAR SP Appendix 9.5B, Section A.1.7.2 states in part, "Redundant safe shutdown circuits in Rooms 1101, 1120, 1121, and 1122 of this area are protected by preaction sprinkler systems. One train of centrifugal charging is assured for hot shutdown for a fire in the west corridor (Room 1101) due to at least 35 feet of separation, suppression, and detection."

This paragraph will be clarified to state, " Redundant trains of centrifugal charging are located in Room 1101. One of the redundant trains of centrifugal charging is assured for hot shutdown in the event of a fire in this area. These redundant trains are separated by a horizontal distance of greater than 35 feet. Cable trays do traverse through the separation zone. However due to the fire resistance of the IEEE-383 cables in conjunction with the installed fire protection features of this area that include automatic detection and suppression, a fire propagating across the 20 foot separation zone is not considered credible."

For Fire Area A-18, FSAR SP Appendix 9.5B, Section A.18.7.2 states in part, "This area contains predominately Separation Group 1 circuits and equipment. With the exception of the B train auxiliary feedwater and steam generator PORV control cables discussed below, redundant Separation Group 4 circuits and equipment are located in the south electrical penetration room, which is in another fire area. For a fire in fire zone A-18, it is assumed that secondary side heat removal is accomplished using motor-driven auxiliary feedwater pump B and steam generators A and D. However, control cables for the A steam generator atmospheric PORV (ABPV0001) and for the B-motor driven auxiliary feedwater pump discharge isolation valves (ALHV0005 and 7) route through this fire zone. The raceways associated with these cables are located greater than 20 feet from any opposite train auxiliary feedwater components or cables, with automatic detection and suppression. If the raceways associated with the B motor-driven auxiliary feedwater system are lost, the A motor-driven auxiliary components would still be available due to the 20 feet separation with detection and suppression. However, manual Operator action would be required to manipulate the B steam generator atmospheric PORV (ABPV0002) since its control cable could also be lost in the fire. Three narrow range level transmitters are available to monitor steam generator A level; therefore, wide range level transmitter LT-501 is allowed to fail."

This section will be revised by adding the following statement, "There are several cable trays, motor control centers, and the room cooler which traverse the 20 foot separation zone. However due to the fire resistance of the IEEE-383 cables in conjunction with the installed fire protection features of this area, a fire propagating across the 20 foot separation zone is not considered credible."

For Fire Area A-27, FSAR SP Appendix 9.5B, Section A.27.7.2 states in part, "The redundant Separation Groups 1 and 4 circuits in this area are separated by greater than 20 feet."

This section will be revised by adding the following statement, "The 'A' Train pressurizer PORV cables are separated by a distance of greater than 20 feet from the 'B' Train pressurizer PORV and block valve cables, and the 'A' Train component cooling water circuits are separated by a distance of greater than 20 feet from the 'B' Train component cooling water circuits. There is a motor control center, several cable trays, an air handling unit, and a control rod drive motor generator set which traverse the 20 foot separation zone. However, based on the fact that the motor control center is enclosed within a metal cabinet, the intervening cables are IEEE 383 rated, and the installed fire protection features of this room, a fire propagating across the 20 foot separation zone is not considered credible."

For 10CFR50 Appendix R Requirements, FSAR SP Appendix 9.5E contains Union Electric's response to those requirements listed. Section III.G.2 of Appendix R states, "Except as provided for in paragraph G.3 of this section, where cables or equipment, including associated non-safety circuits that could prevent operation or cause maloperation due to hot shorts, open circuits, or shorts to ground, of redundant trains of systems necessary to achieve and maintain hot shutdown conditions are located within the same fire area outside of primary containment, one of the following means of ensuring that one of the redundant trains is free of fire damage shall be provided:

a. Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier;

b. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustible or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area; or

c. Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area;..."

Union Electric's response to this Appendix R Section states, "Redundant trains of systems required to achieve and maintain hot standby are separated by 3-hour rated fire barriers, or the equivalent provided by III.G.2, or else a diverse means of providing the safe shutdown capability exists and is unaffected by the fire."

This section is will be revised by adding the following statement, "Specific plant configurations for III.G.2.b 20 foot separation distances and intervening combustibles are detailed in the appropriate Fire Area safe shutdown analysis section."

REGULATORY ANALYSIS

5.1 No Significant Hazards Determination

AmerenUE has evaluated whether a significant hazards consideration is involved with the proposed change by focusing on the three standards set forth in 10 CFR 50.92 as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No

   A design basis accident occurring simultaneously with a fire hazard is not assumed. Failure of plant systems and components required for safe shutdown is not postulated unless that equipment is exposed to the fire. The FSAR Fire Hazards Analysis concludes that a fire within Fire Areas A-1, A-18, and A-27 will not affect the safe shutdown of the plant. A fire propagating along cable trays across the 20 foot separation zones is not considered credible for these fire areas~~,~~ **based on the low burning rate of IPEEE cables in conjunction with the defense in depth in fire protection capabilities in the areas.** The fact that intervening cables are located within the 20 foot separation zone will not increase the radiological consequences of an accident evaluated previously in the FSAR.

   In accordance with the requirements of FSAR SP 3.1.2.a, the location of the intervening cable trays in Fire Areas A-1, A-18, and A-27 will not cause initiation of a Design Basis Accident. The intervening cable trays, motor control centers, and air handling units located in the 20 foot separation zones do not increase the probability of an accident evaluated in the FSAR. The location of the cable trays, motor control centers, and air handling units within the 20 foot separation zones does not degrade the reliability of any safe shutdown component. No additional equipment is assumed to be damaged during a fire in Fire Areas A-1, A-18, and A-27 due to the cable trays, motor control centers, and air handling units located within the 20 foot separation zones. This change does not alter or degrade the function of any safe shutdown components.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No

   A fire event has previously been evaluated for Fire Areas A-1, A-18, and A-27 in the FSAR Fire Hazards Analysis. This analysis determined that safe shutdown of the plant would not be affected by a fire in this area. The change to the FSAR clarifies the configuration of cable trays and equipment within the 20 foot separation areas. This change does not create the possibility of any new accidents of a different type than any evaluated previously in the FSAR.

The configuration of cable trays, motor control centers, and air handling units, within the 20 foot separation zones of these areas does not change the failure modes of any safety related equipment. A fire event has been previously evaluated for these fire areas in the FSAR Fire Hazards Analysis. The analysis determined that a fire in these areas would not prevent safe shutdown of the plant. The intervening cable trays, motor control centers, and air handling units in the separation zones do not create the possibility of a new or different kind of accident than any evaluated previously in the FSAR.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No

The fire hazards analysis is not defined in any Technical Specification. This change does not reduce the margin of safety as defined in the basis for any Technical Specification. There will be no effect on the manner in which safety limits or limiting safety system settings are determined nor will there be any effect on those plant systems necessary to assure the accomplishment of protection functions.

Therefore, the proposed change does not involve a reduction in a margin of safety.

Based on the above evaluations, AmerenUE concludes that the activities associated with the described change present no significant hazards consideration under the standards set forth in 10 CFR 50.92 and accordingly, a finding by the NRC of no significant hazards consideration is justified.

5.2 Regulatory Safety Analysis

Applicable Regulatory Requirements/Criteria

The regulatory bases for the fire protection system are 10CFR50 Appendix A, General Design Criterion (GDC) 3 and Regulatory Guide 1.120.

The fire protection system is designed to detect fires, protect the plant against damage from fire, minimize hazards to personnel, and reduce property loss due to fire.

General Design Criterion 3, "Fire Protection," requires that structures, systems, and components important to safety be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. Fire detection and fighting systems of appropriate capability shall be provided and designed to minimize the adverse effects of fires on structures, systems and, components.

Regulatory Guide 1.120, Revision 1, "Fire Protection Guidelines for Nuclear Power Plants," presents guidelines acceptable to the NRC staff for implementing GDC 3 in the development of a fire protection program for nuclear power plants by ensuring the capability to shut down the reactor and maintain it in a safe shutdown condition and to

minimize radioactive releases to the environment in the event of a fire. FSAR Appendix 9.5A provides a summary of the compliance to this regulatory guide.

Analysis

There have been no changes to the fire protection system design such that any of the above regulatory requirements and criteria would not be met. This amendment application only involves making clarifications to the FSAR Fire Hazards Analysis.

Conclusion

The evaluation performed by AmerenUE concludes that Callaway Plant continues to comply with the above regulatory requirements.

6.0 ENVIRONMENTAL EVALUATION

AmerenUE has determined that the proposed amendment would change requirements with respect to the installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. AmerenUE has evaluated the proposed change and has determined that the change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amount of effluent that may be released offsite, or (iii) a significant increase in the individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), an environmental assessment of the proposed changes is not required.

7.0 REFERENCES

1. NRC Letter, dated October 30, 2000 that transmitted NRC Inspection Report 50-483/00-13

2. ULNRC-04347, dated November 30. 2000.

3 NRC Letter, dated March 6, 2001

4. **NIST Technical Note 1291, Fire Performance of Wire and Cable: Reaction-to-Fire Tests – A critical Review of the existing Methods and of New Concepts. (Section 5.3)**

5. **Regulatory Guide 1.189, Fire Protection for Operating Nuclear Power Plants**